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THE AMERICAN
JOURNAL OF PHARMACY

VOL. 104 OCTOBER, 1932 No. 10

EDITORIALS

AN ACID REACTION

"AMERICAN MEDICINE" is a monthly journal issued and *copyrighted*(!) by the American Medical Publishing Company* of somewhere. Every so often this periodical breaks out in a rash, the rash sometimes assuming the form of an editorial—and sometimes occurring as an advertisement.

Such an advertisement of "Vitilor" appearing in the December, 1931, issue is copied (without permission perhaps) in the *Journal of the American Medical Association* as a frank and rank example of the kind of copy that should *not* appear in medical journals.

Vitilor is a patent—and potent—drinking water activator which according to *American Medicine* is indicated in Syphilis—Nephritis—Diabetes—Pyogenic infections—and the printer's devil overlooked the *etcetera.*

Shades of old Doc Munyon—and Lydia Pinkham—and Tono Bungay—and—oh, well!—Why be so feline!!!

For that was not the inciting cause of this bit of writing!

Rather it was a rash editorial entitled "The Forensic Pharmacist," and which appeared in a recent issue of the periodical.

It does not matter much who wrote this illinformed and unnecessarily sarcastic article.

Doubtless it had the same origin that directed the acceptance of the Vitilor advertising.

The very first sentence of the editorial is proof ample of such bad judgment—to say nothing of bad taste.

*Not under any circumstances to be confused with the American Medical Association of Chicago.

This is it:—

"With mingled amazement and amusement one reads that the Philadelphia College of Pharmacy and Science is about to inaugurate a class in crime-detection for its students." In comment we reprint from the catalog of the College this bare statement:—

COURSE IN SCIENTIFIC METHODS OF CRIME-DETECTION

Professors Charles H. LaWall, F. X. Moerk, J. W. Sturmer, Horatio C. Wood, Arno Viehoever, Louis Gershenfeld, Ivor Griffith, Paul Q. Card, Marin S. Dunn, William J. Stoneback, Frank N. Moerk, Arthur Osol, J. W. E. Harrisson, with the assistance of an expert in Finger-print work; and of Dr. William S. Wadsworth, Coroner's Physician to the County of Philadelphia

Two lecture hours, four conference hours, four library hours, sixteen laboratory hours per week. Credit: 26 semester hours.

Offered as a *major* course for the *Degree of M. Sc. in Chemistry;* but also offered as a special course in whole or in part to properly qualified applicants.

Another choice bit of the *American Medicine* editorial is the following:—

"Is what amounts to 'forensic pharmacy,' not an encroachment on 'forensic medicine'—a study of the detection of poisons, of ballistics, of microchemistry and food analysis, drugs, fibers, etc., seem to tread on dangerous border lines."

To which we say—piffle!!

For this writer to have coined the word couplet "Forensic Pharmacy" implies nothing less than crass ignorance or stupidity—for this course has nothing to do with the Pharmacy Department of the College, but is part of the work of the Science Department.

If the editor had familiarized himself with the nature of this course, the qualifications of those to be enrolled for the work, the scope and reputation of this teaching institution and the excellence of its courses in Chemistry as well as in Pharmacy—he would not have so rashly and brashly rushed into print.

It might be illuminating to *American Medicine* to know that dozens of interested persons, detectives, police officials, and students in science, applied for entrance to the class—but were refused admission because of the inadequacy of their previous training.

It might be interesting too—to note in conclusion—that a clipped sheet bearing the *American Medicine* editorial came to this office, with a none-too-complimentary comment upon it, from two different persons, both of them editors of nationally known and reputable *medical* journals.

IVOR GRIFFITH.

SELL PHARMACY

THE UP-TO-DATE drug store sells many kinds of things. Sometimes it neglects to sell a most profitable item—Pharmacy. As one speaker has expressed it: "The drug store of today is not 'pharmacy conscious.'"

In our stores we carry on the business of a drug store, but do not look and act the part. It is quite believable that the overstressing of the merchandising phase in the modern drug store, with a consequent neglect of pharmacy, has given to our stores a changed status and helped to relegate them to a lower caste.

Why not give to our shops a pharmacy atmosphere?—surround every item which we sell with a halo of pharmacy?

Why not pharmacize the whole store?

Why not wrap in every package the spirit of pharmacy?

Perhaps an extra charge can be made for this. But, in any event, it will count towards goodwill, prestige, and reputation—all of which is worth money.

To take this step does not mean that the old-time dingy drug shop shall be brought back, or that the modern drug store shall be re-made.

It is only necessary that the present-day drug store, with its glowing fixtures, its large stocks of merchandise of many sorts and kinds, shall add a few simple elemental features such as will cause the place to be recognized as a pharmacy.

These may include: the restoration of the colored show globes to the window; the placing of a large mortar and pestle in a conspicuous place on the fixtures; the making of an exhibit of some pharmaceutical operation such as percolation, distillation, evaporation, pill making, etc. A display of crude drugs always attracts attention. A modern attention winner is a show of drug plants obtained from a florist, or, better still, grown in one's back yard. A wall section, the top of a counter, a show case, a booth wherein pharmacy is delineated, will enliven, vivify, and give a pharmaceutical twist to the store.

A heroic move, but one which has won out wherever it has been tried, is the installing of the open prescription department. Here the customers see pharmacy in action—prescriptions being prepared behind a plate glass window. They are awed and inspired, and go home talking about it. It becomes continuous propaganda.

Pharmacy can be sold at a profit. We are told of a store in the midwest where the atmosphere of pharmacy predominates. Patent medicines and cut-rate stuff are sold, but they are not in sight. Drugs, medicines, household needs, "keep well" stuff, including toiletries, occupy the center of the stage. Seven registered men are employed. Pharmacy is here made to count on the profit side. Imported perfumes are sold at twenty-five dollars per bottle. Beauty lotions bring twelve dollars per package. In this store the cheapest hair brushes are priced at four dollars each. No tooth brushes are sold under one dollar each. The patrons of such a store know that they are trading in a high-grade pharmacy where they get the best of everything and are willing to pay the price.

The zest, flavor and vitality of the foods and drinks which pass over the soda lunch counter can be greatly vivified through the pharmacy.

Pharmacy can be made to permeate every department of the store.

The drug store must rely upon pharmacy for character, prestige, and permanence.

The customers who pass in and out of the drug store and go away to their homes should carry away with them something more than their bundles. They should receive and carry away the "idea and the spirit" of pharmacy.

Selling pharmacy is selling service. Selling service, selling pharmacy, will pay goodly returns.

FRED B. KILMER.

ORIGINAL ARTICLES

IS GERM CHLORINATION FATAL?

By David Wilbur Horn, Ph. D.

WHEN a water is chlorinated to render it safe, and its safety is subsequently judged by bacterial growth upon the artificial culture media of the laboratory, there seems to be room for question whether or not the free chlorine itself may so interfere with possible growth upon culture media as to abort this growth. Chlorinated germs may be viable, but their growth may be inhibited by the active chlorine present with them in the water and sown with them into the culture media.

The writer heard this questioned about two decades ago at the Philadelphia Engineers' Club in a meeting and discussion relating to the Torresdale Filter Plant. He met with it again recently when it was discussed by an inspector of swimming pools. The inspector seemed able to make the management feel that the findings received from the laboratory were not fair, but gave an optimistic impression of the true bacterial condition of the chlorinated pool water. Much less satisfactory results were to be expected, he held, if the active chlorine were destroyed chemically at the time of sampling. In this practical matter of potential interest in swimming pool control, it seemed proper to seek some information by direct experiment.

Experimental Procedure

The experiments described below were performed on three waters from outdoor pools, chlorinated with gas by Wallace & Tiernan chlorinators, and filtered through pressure filters using soda and alum. An antichlor, sodium thiosulphate, was added in excess at the time of sampling in experiments 1 to 4; just before plating, in experiments 5 and 6; and, lastly, the antichlor was added to one portion of the water at the time of sampling and to another portion just before plating, in experiments 7 and 8. The elapsed time between sampling and plating ranged from one to four hours.

The active chlorine in the pool waters examined ranged from 0.2 to 0.6 ppm. as determined by orthotolidine. In each case, after plating, the fact that no free chlorine still persisted in the antichlorinated water was confirmed by orthotolidine test. Bromthymol blue

TABLE OF EXPERIMENTS

Number	Date 1932	Description of Sample	Ppm. Active Chlorine	pH	Bacterial Count	Tests for B. Coli Group 10 cc.	1 cc.	1/10	1/100	1/1000	1/10000	1/100000 cc.
1	7/29	Chlorinated Sample	0.35	7.6	160	+	—	—	—	—	—	—
		Same, reduced at sampling			126	—	—	—	—	—	—	—
2	8/9	Chlorinated sample	0.30	7.4	1	—	—	—	—	—	—	—
		Same, reduced at sampling			1	—	—	—	—	—	—	—
3	8/10	Chlorinated sample	0.50	7.4	3	—	—	—	—	—	—	—
		Same, reduced at sampling			5	—	—	—	—	—	—	—
4	8/26	Chlorinated sample	0.30	7.3	6	—	—	—	—	—	—	—
		Same, reduced at sampling			7	—	—	—	—	—	—	—
5	8/16	Chlorinated sample	0.20		0	—	—	—	—	—	—	—
		Same, reduced at plating			0	—	—	—	—	—	—	—
6	8/16	Chlorinated sample	0.40		0	—	—	—	—	—	—	—
		Same, reduced at plating			0	—	—	—	—	—	—	—
7	8/19	Chlorinated sample	0.45	7.6	1	—	—	—	—	—	—	—
		Same, reduced at sampling			4	—	—	—	—	—	—	—
		Same, reduced at plating			0	—	—	—	—	—	—	—
8	8/20	Chlorinated sample	0.50	7.6	64	—	—	—	—	—	—	—
		Same, reduced at sampling			65	—	—	—	—	—	—	—
		Same, reduced at plating			61	—	—	—	—	—	—	—

Note:—Plus sign stands for a positive test; minus sign stands for a negative test.

or cresol red, or both when necessary, were used to determine the pH values. The colors were matched with permanent glass standards in a Hellige-Klett apparatus. It was found that the treatment with thiosulphate did not make any appreciable difference in the colorimetric pH value.

The thiosulphate was used in the form of a solution containing 1.4 grams $Na_2S_2O_3 + 5\ H_2O$ per liter. One cc. of this was used to treat each 100 cc. of pool water; that is, 1.4 milligrams crystallized thiosulphate or 0.85 mg. anhydrous thiosulphate were used in the experiments for treating each 0.02-0.06 mg. active chlorine. The procedure consisted in collecting, or pouring, the pool water in a graduated bottle containing already 1 cc. of the thiosulphate solution. This graduated bottle with the thiosulphate in it, and plugged with cotton, had previously been sterilized in the autoclav at 15 lbs. gauge pressure for 5 minutes.

Thiosulphate solution, both that before and that after sterilization in the autoclav, was tested out against a solution of chlorine gas in the same (chlorinated) tap water as is used to fill and to replenish all three of the pools here under consideration. It was thus found that 1 cc. of the thiosulphate solution was enough to prevent immediately and permanently the color otherwise produced by orthotolidine in 100 cc. of a chlorine water that assayed about four parts per million of active chlorine. That is, under these conditions, 1.4 mg. crystallized thiosulphate or 0.85 mg. anhydrous thiosulphate consumed up to 0.4 mg. of active chlorine. Therefore, in each experiment upon the pool waters, thiosulphate was always well in excess, for the pool waters never contained over 0.06 mg. active chlorine in any of the 100 cc. samples that were antichlorinated.

Remarks

The chemical equations usually given for antichlorination are:

$$Cl_2 + 2\ Na_2S_2O_3 = 2\ NaCl + Na_2S_4O_6 \quad \ldots\ldots\ldots\ldots (1)$$

$$4\ Cl_2 + 5\ H_2O + Na_2S_2O_3 = Na_2SO_4 + H_2SO_4 + 8\ HCl \quad \ldots\ldots (2)$$

$$5\ NaOCl + 3\ Na_2S_2O_3 = 5\ NaCl + 2\ Na_2SO_4 + Na_2S_4O_6 \quad (3)$$

Equation (2) obtains when the chlorine is in excess (Prescott & Johnson); the sulphate is the product of the oxidation of the tetrathionate. Equation (3) is given (Dienert & Wandenbulcke, 1919) for the antichlorination of "javelized" water. Not only these authors,

but also Strunk (1915) established the fact that the exact amount of thiosulphate required varies with the reaction of the water to be antichlorinated. In testing out the thiosulphate as previously described, the result obtained was greater than that required by Equation (1), less than that required by (2), and not far from that required by (3).

These experiments show that the addition of more than enough sodium thiosulphate to prevent any color reaction with orthotolidine, to these heavily chlorinated pool waters, produced practically no effect upon the bacterial findings. The variations observed were such as might occur in any set of comparable findings by the standard bacteriological technique. There is no indication here that when the chlorinated pool waters were handled in the usual way in the laboratory, they gave any better bacteriological results than the same waters gave when previously reduced by sodium thiosulphate,—whether reduced a considerable time before plating, *i. e.*, at the time of sampling, or reduced immediately before plating.

Discussion

Just as the question herein dealt with was hypothetical, so there remain hypothetical objections to this experimental attack upon it. No complete catalogue of such objections need be attempted, but some of them should be mentioned.

First, it might be maintained that the results after antichlorination were found to be the same as before it because of toxic chemical products developed in the interaction of chlor and antichlor. Under this assumption it would seem to follow that such toxic products must be (practically) equal in germicidal power to the active agents in chlorinated swimming pool water. This would be an exceptional coincidence. The known products, namely, sodium tetrathionate, sodium sulphate and sodium chloride, do not lend color to this explanation.

Second, it might be maintained that some of the chlorine had entered into such a stable combination with some of the contents of the bacterial cells that, although the antichlor redured all the extracellular free chlorine, the antichlor failed to break down these hypothetical intracellular chlorine compounds during the time allowed to elapse in these experiments. Pool waters treated with ammonia and chlorine seem to develop color with orthotolidine more slowly than chlorine water does, but the action of chloramine seems nevertheless to be clean cut and quantitative. Eder (1928) recommended the use of

chloramine to remove the last trace of thiosulphate from photographic papers and plates, and the use of standard solutions of chloramine has been recommended for assaying thiosulphates. Some one else may see more promise than the writer does in experiments designed to prove the existence of intracellular chlorine compounds that are inhibitive but not lethal and that are stable from one to four hours in the extracellular presence of an excess of sodium thiosulphate.

Third, it might be maintained that some other antichlor would have given different results. I selected sodium thiosulphate as a fair specimen of antichlors, and as one that would also be generally convenient in experimentation. Sodium thiosulphate has been used (Vignati & Schnabel, 1928) in bacteriologically related experiments subsequent to the disinfecting action of alcohol, copper salts, silver salts, lead salts, and zinc salts. In these cases, bacterial action is revived by treatment with sodium thiosulphate.

Conclusion

The practical issue here involved seems to be met fairly by the experiments. These experiments show that the ordinary bacteriological results obtained on normal chlorinated swimming pool waters are not likely to be misleading just because of the presence of the free chlorine. Normal swimming pool waters, within the limits of chlorination and antichlorination covered by these experiments, may still be judged as safely as heretofore by the bacteriological results obtained in the customary way.

THE DOCTRINE OF AMULETS

The Doctrine of Amulets is not as well known as the Doctrine of Signatures. But even in these days of enlightenment health officials connected with our public schools frequently find a bag of asafetida or camphor hung about the neck of a child, placed there by a cautious mother to drive away the demons of disease. Precious stones and many other articles have played a role in this most interesting doctrine. A necklace of Job's tears has long been used to prevent the formation of kidney stones or as a treatment for one suffering from this ailment. Amber has also been used as a pendant of a necklace as a specific in the treatment of simple goitre.

REPORT OF THE COMMITTEE ON DRUG MARKET to the PENNSYLVANIA PHARMACEUTICAL ASSOCIATION CONVENTION at WERNERSVILLE, PENNSYLVANIA, JUNE 21-23, 1932

MATERIAL entering into the manufacture of medicinal preparations is of necessity subject to the closest scrutiny in order to judge of its fitness for such an important function. Many factors concerning the identity, purity and therapeutic value have to be considered. Substances official in the United States Pharmacopœia or the National Formulary are judged according to the standards given. In cases where more stringent requirements are necessary additional tests are required by the users. Unofficial material is examined according to standards obtained from a study of the material by individuals or of groups qualified to do so. Regulations and standards by National and State authorities have also to be considered. In general the examination takes note of the identity, physical characteristics and the degree of purity. In specific cases the percentage strength, the amount of impurities and many other physical factors are required.

We are very much gratified to report that the quality and purity of crude and finished products have maintained a high average and that an efficient control has been exercised by those entrusted with this duty. In this connection we submit the following observations contributed by J. Mervin Rosenberger.

Prices are generally lower and business retarded. The pharmaceutical manufacturers, as well as the U. S. Department of Agriculture, have had an opportunity to more carefully scrutinize and examine the crude drugs, chemicals and other materials imported, and also those offered for sale in our domestic markets.

Foreign shippers and also domestic growers realize these conditions and we believe are more careful than ever in the selection of the materials which they offer to the manufacturers and wholesalers.

The Government has been very exacting in the labeling of all food and drug materials and has taken action against many manufacturers who have made false therapeutic claims.

In reference to importations of crude drugs by foreign producers, the Department of Agriculture at Washington has this year made a new ruling. Formerly all crude materials imported which did not conform exactly to the requirements of the United States Pharmacopœia, National Formulary or administrative standards were permitted entry into this country under bond, with a guarantee that such materials would be reconditioned so as to come up to the required standards. After this had been accomplished the bond was cancelled and the goods were released by the Department, or if they did not come up to standard, were compelled to be re-exported or destroyed under Government supervision.

The new requirement is that crude drugs offered for entry into the United States must comply strictly with the requirements of the standards set forth, and if such materials do not come up to the standard, they will be refused entry into this country and will not be released under any conditions whatever.

Practically all of the leading foreign shippers are now acquainted with this new ruling and are exercising their best judgment in selecting the quality of the crude drugs shipped to this country.

The quality of the materials offered during the past year, most of which have been from specialty houses in this country, were found to conform to the United States Pharmacopœia, National Formulary and Government standards.

The condition of the chemical market as reflected in the purchases of pharmaceutical manufacturers shows that only a very small number of the thousands of substances examined were sufficiently substandard to be causes of complaint. In fact George B. Slothower reports that only one-half of 1 per cent. of the cases coming under his observation did not meet the specific requirements.

Classifying the substandard chemicals we find that boric acid, tartaric acid, potash alum, iron glycerophosphate and sodium nitrate were unsatisfactory in regard to their solubility or the condition of the resulting solution. Calcium lactate, cinchophen and thymol were unsatisfactory in regard to their odor. Several items were abnormal in color as well as in other requirements. Some substances were found to contain excessive amounts of pemissible impurities such as arsenous iodide containing an excessive amount of free iodine, bismuth oxide hydrated containing an excess of carbonates, light magnesium oxide containing an excess of calcium and tetrachlorethylene with

an excess of carbonizable impurities. Potassium citrate and sodium citrate did not have the proper reaction toward phenolphthalein. Two lots of borax did not contain the proper amounts of water of crystallization and one lot of sodium cacodylate was low in strength. A more serious condition than any of the preceding is that of a lot of calomel which contained an excess of mercuric chloride according to the U. S. P. test.

The quality of fixed and essential oils has been maintained at a high standard. One barrel of a large shipment of cod liver oil was cloudy and contained considerable sediment; this incident shows the necessity of constant watchfulness in control work. A lot of oil of cajuput had a disagreeable odor and two samples of oil of lavender flowers were rejected because of odor and color.

The condition of crude drugs was about as usual. Aconite root containing an excess of stems is occasionally found. A recent shipment of anise seed contained considerable coriander. Apocynum androsaemifolium is usually present in apocynum. Considerable corky bark is found in ulmus. Samples of stramonium leaves, belladonna leaves and sarsaparilla root were found to contain excessive amounts of ash.

Instances of substitution among crude drugs are seen in a small shipment of ipomea consisting entirely of jalap. A shipment of chimaphila was found to consist of the leaves of the pyrola species.

Concerning the quality of spices, Joseph W. E. Harrisson reports that: "Generally the condition in the spice and drug market was satisfactory as far as the quality of goods received was concerned. Naturally, a number of rejections occurred, but on the whole, the picture is favorable."

All of the samples of allspice, cloves, mace, marjorum, nutmeg, paprika, black pepper and red pepper were of acceptable quality. Samples of cinnamon, coriander and thyme were rejected because of high ash content. A sample of ginger was unsatisfactory because of a high calcium oxide content. Two samples of cayenne pepper did not meet the U. S. P. pungency test.

In addition to the foregoing general observations and analyses your committee submits the following more specific information upon the material examined. This material was submitted by the following laboratories—Sharp & Dohme, LaWall and Harrisson, and Smith, Kline and French.

Acid Boric Powder

Two lots were rejected because they did not meet the U. S. P. solubility requirements.

Acid Carbolic

One sample was rejected because of a pink coloration.

Acid Hydrocyanic

One lot was rejected because it contained only 1.74 per cent. of hydrocyanic acid. The U. S. P. IX standard is not less than 1.9 per cent. and not more than 2.1 per cent. hydrocyanic acid.

Acid Lactic

One lot submitted as an 80 per cent. water-white grade was found to be of the strength specified but it had a yellow color, a decidedly sour odor and an excess of carbonizable impurities, and contained traces of chloride and sulphate. Two other samples of U. S. P. grade were submitted. One was of U. S. P. quality but the other had a sour odor and contained an excess of carbonizable impurities.

Acid Tartaric

An unusual amount of insoluble foreign matter was present in one lot of tartaric acid.

Alum-Potash

Two lots were rejected because they did not yield a satisfactory aqueous solution.

Arsenous Iodide

One lot was offered which contained an excessive amount of free iodine.

Asafetida

One case was delivered which did not comply with the U. S. P. requirements.

Bismuth Oxide Hydrated

One lot was rejected because it contained an excessive amount of carbonates.

Borax

Two samples were offered which had been too thoroughly dried and did not contain the full amount of molecular water for U. S. P. Borax. One sample assayed 56.8 per cent. $Na_2B_4O_7$ and the other sample assayed 59.3 per cent.

Calcium Lactate

An excess of volatile fatty acids was present in two lots of Calcium Lactate.

Calomel

One lot offered by a little known manufacturer contained an excessive amount of Mercury Bichloride. The sample also contained less than 99.6 per cent. of mercurous chloride as required by the U. S. P., and upon assay showed only 98.35 per cent. of mercurous chloride.

Caramel

Several samples have been offered during the past year that showed very poor tinctorial power.

Chamomile Flowers

One small parcel refused for the reason that it contained an excess of foreign organic material.

Cinchophen

Two lots were rejected because they possessed a strong and objectionable odor.

Cinnamon

Fifteen samples were examined of which two were rejected due to high ash and acid insoluble ash.

Coriander

Of eight samples examined one was rejected due to excessive ash and acid insoluble ash.

Cudbear

One lot was rejected because it possessed only 60 per cent. of the tinctorial power of a standard sample.

Digitalis

Of the five samples examined all were passed. The strength ranged from 120 to 220 per cent.

Ergot

Fifteen samples of crude ergot examined were satisfactory insofar as infestation or mold growth, but of this lot it was necessary to reject eight samples due to an activity of less than 50 per cent.

Flea Seed (Psyllium Seed)

Several lots received contained an excessive amount of foreign matter. The goods were ordered to be again recleaned.

Gelatin

Several cases were received containing sulphur dioxide in excess of the Pennsylvania State Food Law requirements which are considerably stricter than the National Law. These goods were rejected as they would have had to be labeled "technical" which would have been unsatisfactory to the retail drug trade.

Ginger

Of the ten samples examined one was rejected due to a high content of calcium oxide.

Irish Moss

Bleached samples tested were found to contain sulphur dioxide which was used for bleaching.

Iron by Hydrogen

Several chemical houses were compelled to replace their stocks due to the fact that they did not comply with the requirements of th U. S. P. For a short priod of time it was difficult to obtain a strictly U. S. P. Iron by Hydrogen.

Iron Glycerophosphate

One lot was rejected because it was reddish-yellow in color and did not meet the N. F. solubility requirements.

Iron Phosphate Precipitated

An excessive amount of ferric iron was present in one sample.

Lard Benzoinated

One lot was rejected because it had a rancid odor and taste.

Magnesium Oxide Light

One lot that was offered for U. S. P. Magnesium Oxide Light contained an excessive amount of calcium.

Oil of Cajuput

One sample was rejected because it possessed a disagreeable odor.

Oil of Cod Liver

One drum of a large shipment was rejected because it was cloudy and contained considerable sediment.

Oil of Lavender Flowers

Two samples were rejected because they had an abnormal odor and color.

Oleoresin Malefern

One lot was rejected because it showed on assay only 21.93 per cent. of Filicin. The U. S. P. standard is not less than 24 per cent. of Filicin.

Pepper—Cayenne

Four samples were received, two of which met the pungency test of the U. S. P.

Petrolatum—Liquid

An abnormal amount of solid paraffin was detected in one shipment.

Potassium Citrate

One sample that was offered did not conform to the U. S. P. requirements in that an aqueous solution was alkaline to phenolphthalein.

Saffron

A shipment was refused because it contained an excessive amount of yellow styles and an excessive amount of moisture.

Sandalwood Chips

A small parcel was received deficient in oil.

Soap—Castile—Powdered

Two lots were of U. S. P. quality except that they had low iodine numbers of 71.39 and 71.23. The iodine number of castile soap is generally below the U. S. P. standard but both of these samples yield results so far below the U. S. P. standard of 84 to 90 that they were far from satisfactory and were much lower than the usual sample.

Green Soap

One lot was rejected because it contained 54.8 per cent. water and possessed an objectionable odor. The U. S. P. standard is not more than 52 per cent. water.

Sodium Cacodylate

One lot that was offered assayed 70.0 per cent. of Anhydrous Sodium Cacodylate. The U. S. P. requires that Sodium Cacodylate should contain not less than 72 per cent. and not more than 75 per cent. of Anhydrous Sodium Cacodylate.

Sodium Citrate

One lot that was offered did not conform to the U. S. P. requirements in that an aqueous solution was alkaline to phenolphthalein.

Sodium Nitrate

One lot was rejected because it contained an excessive amount of insoluble fibrous material.

Spices

Deliveries of Nutmegs and Mace were found to be insect infested and in one case slightly mouldy.

Squill

All of the samples examined were passed. The strength ranged from 100 to 180 per cent.

Squill—Red

Of the ten samples examined, five were rejected as requiring too large a dose to cause death in control animals.

Tetrachlorethylene

One lot was offered that contained an excessive amount of carbonizable impurities.

Thyme

Two samples were examined, both of which were rejected due to high ash and acid insoluble ash.

Thymol

One lot was rejected because the crystals were yellow in color and possessed a pungent odor. U. S. P. Thymol Crystals should be colorless and have an aromatic odor.

The following table shows the results of the Pharmacological assay of nineteen samples of crude drugs made in the Pharmacological Laboratory of Sharp & Dohme, Inc., during the year June 1, 1931, to June 1, 1932.

Drug	No. Samples	Assay Lowest	Assay Highest	Standard Above	Standard Below
Cannabis	2	100%	115%	2	0
Digitalis	4	108%	120%	4	0
Ergot	8	116%	300%	8	0
Squill	5	72%	98%	0	5
Total	19			14	5

Respectfully submitted,

J. G. Roberts, *Chairman.*
George A. Slothower,
J. W. E. Harrisson,
J. Mervin Rosenberger.

CAT TAIL IN INDIAN MEDICINE

Every part of the common Cat Tail was used by various tribes for some sort of ailment or other. The Cherokees crushed the roots by pounding or chewing and applied the mass as a poultice to sores. The Omaha tribe used the roots and ripe blossoms for scalds. For this purpose the root was powdered, wetted and spread as a paste over the scald. The ripe blossoms were then applied as a covering and the injured part bound, so as to hold the dressing in place. Another use of the Cat Tail was that of employing the fuzzy down in which to place the newly-born babies.

A CHEMICAL GARDEN

By C. C. Pines

Assistant Professor of General Chemistry, Philadelphia College of Pharmacy and Science

IN SCIENCE exhibitions held at the Philadelphia College of Pharmacy and Science during the early part of 1932, chemical gardens or as they are sometimes called, chemical forests, were displayed and one of them photographed. (See picture in *Druggists' Circular,* June, 1932, page 12.) Since that time a number of requests have come to the writer asking for information about these gardens, which are made entirely from chemical substances. To serve those who may be interested in making chemical gardens, details are given below.

The solution in which the plant-like structures of the garden grow, is prepared by diluting sodium silicate solution (sp. gr. about 1.4), commonly known as water glass, with distilled water, using three or four parts of water to one part of the silicate solution. This diluted water glass is then poured into a suitable glass vessel such as a battery jar or fish bowl and various chemicals are dropped into the liquid. When the chemicals which should be in the form of crystals or crystal fragments come in contact with the sodium silicate solution, insoluble silicates are formed which sprout up through the solution assuming many peculiar shapes and exhibiting different colors, depending on the chemicals used.

Chemicals which may be used and the colors of the growths produced are given in the following tabulation:

Cupric sulphate (blue stone, blue vitriol)	greenish blue
Ferric ammonium sulphate (ferric alum)	reddish brown
Nickel nitrate	green
Cobalt chloride	purplish blue
Ferrous sulphate (green vitriol)	white
Uranium nitrate	bright yellow
Manganese chloride	white
Lead acetate (sugar of lead)	white
Aluminum ammonium sulphate (alum)	white
Magnesium sulphate (epsom salt)	white
Zinc sulphate (white vitriol)	white

Some of the silicate growths change color due to oxidation and the colors given above are observed when the different chemicals are first immersed in the sodium silicate solution. For example, the

growth from ferrous sulphate turns green and that from manganese chloride changes to a light brown, on standing.

Where large crystals of a chemical are available, one piece immersed in the silicate solution often gives surprising results. For instance, ferric alum yields growths resembling the arms of an octopus and with a large piece sprouting these arms, a fantastic shaped sea serpent is formed.

Other chemicals than those mentioned above can be used if they are somewhat soluble in water and form insoluble silicates, but common sodium, potassium and ammonium salts because they form soluble silicates yield no growths. Other dilutions of the sodium silicate solution may be used also, but if the silicate is diluted too far, some of the chemicals used react so rapidly that a coating of insoluble material forms over them and very little, if any, vertical growth occurs.

As a suggestion make a chemical garden for your Pharmacy Week window or have your customers make one in the store. This is easily done by having a prepared water glass solution at some convenient spot in the store—and with the crystals put a sign reading, "drop in a crystal and watch it grow." Ferric alum, cobalt nitrate, manganese chloride and nickel nitrate grow in a few seconds after immersion, other compounds may require a few minutes before they begin to sprout.

If a display of more than one attraction is possible, a lead tree or silver tree may be made. The lead tree is made by suspending a strip of zinc in a 3% lead acetate solution. Distilled water should be used in making the solution. The strip of zinc should be cut along the edges so that the metallic lead which separates on the zinc will have a horizontal surface to branch from. Some time will elapse before the lead begins to crystallize into the leaf-like form. The container in which the tree is forming must not be moved or otherwise disturbed.

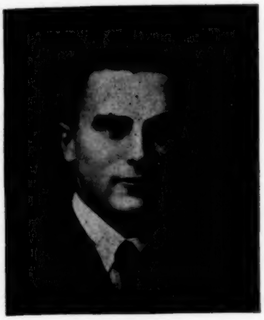
The silver tree is made in much the same manner as the lead tree, by suspending a strip of copper in a weak silver nitrate solution containing from three to five grams of silver nitrate to the liter. Metallic silver separates on the copper and after standing a few hours, undisturbed, tree-like branches appear. If there is a microscope available, the separation of metallic silver which is very beautiful, can be watched, preferably under low power. To see this action put a small piece of copper wire (scraped bright) on a microscope slide, get a side of the wire in focus and then drop silver nitrate solution on the wire, silver will begin to separate immediately.

INSECT FRIENDS AND FOES*

By Marin S. Dunn, Ph. D.

Assistant Professor of Zoology, Philadelphia College of Pharmacy and Science

"THAT which the palmerworm hath left hath the locust eaten; and that which the locust hath left hath the cankerworm eaten; and that which the cankerworm hath left hath the caterpillar eaten."—Joel 1:4.



Marin S. Dunn, Ph. D.

Foes

Suppose the United States were at war, and during the course of the struggle the enemy landed an invading force upon our shores. Let us furthermore imagine that force to be unscrupulous enough to destroy forests, crops, vegetables, stored goods, valuable records, houses, and in fact almost everything with which it came into contact. Just think how the country would rise to arms and fairly burn with eagerness to crush the foe. Not only would those States directly in touch with the invaders be involved, but money, supplies and men would pour toward the danger zone from every town and village throughout the length and breadth of the land. But our imagined enemy is ruthless. It does not stop with the destruction of possessions, but it takes human life as well. It strikes men, women and even children—babes in arms—with equal unconcern. The death is not always quick, but may be lingering and painful. Against such an enemy, the nation would rise, and, boiling with rage, would pour forth its life blood, if necessary, almost to the last man. We justly pride ourselves upon our independence, and tribute to a conqueror is unthinkable.

And yet, the United States (as almost the whole world) every year is suffering from the attacks of invaders to whom it pays tribute to the tune of almost two billion dollars. The enemy I refer to is the ever-increasing insect horde which threatens our lives, homes, crops and forests. As a nation, we are not yet aware of the danger, although

*Lecture delivered as one of a Series of Popular Science Lectures, Season of 1932.

many of us are beginning to suspect vaguely that a tremendous contest is taking place. Only men who have spent much of their lives in learning to know and understand insect life are in a position to appreciate the strength, the versatility and the cunning of the foe. It is not so long ago that the individual who studied "bugs" was regarded as eccentric and slightly "touched." But this attitude has gradually changed, and it is to our credit that today many of our colleges and universities have departments where young men and women may be trained in entomology. The Bureau of Entomology of the Department of Agriculture at Washington contains hundreds of scientifically trained workers, and the Association of Economic Entomologists, begun near the close of the last century by a few far-seeing men, has now over one thousand members. Likewise, entomological workers are present in the Agricultural Experiment Stations of each State. But we are only making a beginning in our fight. As the population of this country has grown, so the number of insect foes has grown.

I mentioned the estimated loss due to insects in the United States each year was in the neighborhood of two billion dollars. Most of the money thus spent is represented as loss due to damage of crops, etc., but it does not represent secondary money losses due to changed economic conditions. For example, when the cotton boll weevil seriously attacked the cotton crop—the principal crop of certain sections of the Southland—planters unable to realize money on their cotton crop were unable to pay mortgages on their plantations. They also could not pay negro workers to help them fight the pest. As a result, rich men found themselves penniless and many took as they saw it the only way out—suicide; banks failed—and all due to the activities of one kind of insect.

And then there is the loss due to insect activities in building material—a very difficult matter to estimate. Most of these losses may be unsuspected because they occur inconspicuously, and only upon examination does the truth come to light. The termites or white ants may attack the timbers of a house in their frantic search for cellulose, and the principal supporting beams—in fact, even furniture—may become hollow shells before the damage is noticed.

How can we estimate the loss to the consumer when the prices on fruits and vegetables rise due to smaller crops occasioned by insect visitation? Of course, it does not always follow that small crops mean high prices. Lack of transportable products means less work for rail-

roads and others concerned, and so on down the line a series of unsuspecting people may be economically affected.

†The following table is a conservative estimate of loss due to insects in the United States for 1929 taken from Metcalf and Flint:[8]

DEBIT

Damage to:		Per Cent.	Estimated Loss Due to Insects
2,622,189,000 bu.	Corn crop	9	$184,332,000
806,508,000 bu.	Wheat crop	9	75,683,000
1,238,654,000 bu.	Oats crop	5	26,922,000
387,951,000 bu.	Barley, rye and rice crops	8	19,472,000
114,639,000 tons	Hay crop	11	148,395,000
2,157,000 bu.	Cloverseed crop	28	6,138,000
100,845,000 bu.	Grain sorghums crop	7	5,013,000
49,639,000 gal.	Cane and sorgo syrup crop	7	2,925,000
3,040,000 tons	Sugar-cane crop	20	2,304,000
7,672,000 tons	Sugar beet crop	15	8,651,000
1,360,277,000 lb.	Peanut crop	3	1,477,000
14,919,000 bales	Cotton crop	15	183,754,000
6,630,000 tons	Cotton seed crop	15	30,164,000
28,295,000 bu.	Cowpea and soybean crop	5	2,871,000
1,500,891,000 lb.	Tobacco crop	10	28,558,000
Total estimated damage to staple crops by insects			$726,659,000

Damage to:		Per Cent.	Estimated Loss Due to Insects
393,064,000 bu.	Potato crop	15	$77,454,000
84,661,000 bu.	Sweet potato crop	5	4,000,000
19,337,000 bu.	Dry bean crop	10	7,290,000
167,600 tons	Snap bean crop	8	1,358,000
287,500 bu.	Green peas crop	12	2,560,000
1,069,000 tons	Cabbage crop	20	4,250,000
25,867,000 bu.	Onion crop	20	3,807,000
9,907,000 crates	Asparagus crop	5	840,000
16,799,000 crates	Cantaloupe crop	20	4,471,000
67,616,000 no.	Watermelon crop	15	1,773,000
8,644,000 bu.	Cucumber crop	20	2,410,000
8,686,000 crates	Celery crop	10	1,437,000
20,325,000 crates	Lettuce crop	5	1,851,000
1,846,000 tons	Tomato crop	7	3,554,000
Carrots, cauliflower, sweet corn, eggplant, peppers, and spinach crops, average		10	3,363,000
Total estimated damage to vegetable crops by insects			$120,418,000

†Reprinted by permission from "Fundamentals of Insect Life," by Metcalf and Flint. Published by McGraw-Hill Book Co., New York, N. Y., 1932.

Damage to:		Per Cent.	Estimated Loss Due to Insects
139,754,000 bu.	Apple crop	20	$36,820,000
45,998,000 bu.	Peach crop	20	12,541,000
20,903,000 bu.	Pear crop	8	2,396,000
19,083,000 bu.	Plum and prune crop ...	8	2,289,000*
177,500 tons	Other tree fruits crop ..	10	1,197,000*
2,022,000 tons	Grape crop	15	8,908,000
541,500 bbl.	Cranberry crop	6	425,000
331,441,000 qt.	Strawberry crop	10	4,487,000
112,795,000 qt.	Other small fruits crop..	8	1,804,000*
33,100,000 boxes	Orange crop	10	12,052,000
6,500,000 boxes	Grapefruit crop	10	1,982,000
5,900,000 boxes	Lemon crop	10	2,242,000
34,500 tons	Nut crop	10	1,313,000*

Total estimated damage to fruit and nut crops by insects .. $88,456,000

Damage to:	Per Cent.	Estimated Loss Due to Insects
$61,892,000 worth Flowers and flowering plants	12	$7,427,000
$15,487,000 worth Vegetables and vegetable plants grown under glass	12	1,858,000
$20,434,000 worth Nursery products	15	3,065,000

Total estimated damage to nursery and greenhouse products by insects $12,350,000

Damage to:	Per Cent.	Estimated Loss Due to Insects
13,440,000 head of horses	1/2	$ 4,751,000
5,322,000 head of mules	1/2	2,208,000
57,967,000 head of cattle	4	132,804,000
48,913,000 head of sheep	3	13,065,000
52,600,000 head of hogs	1/4	1,793,000
469,457,000 head of poultry	5	23,660,000

Total estimated loss to livestock production by insects	$ 178,281,000
Total estimated damage to all products in storage by insects	300,000,000
Total estimated damage to forest trees and forest products by insects	130,000,000
Total estimated economic loss by insects that carry human diseases	50,000,000

GRAND TOTAL of estimated loss due to insects $1,606,164,000

*Statistics for latest year available to us.

Of course, the actual amount of losses varies from year to year, and because of their very scope, the figures must needs be inaccurate. Sanderson and Peairs [9] give an estimate of the annual losses chargeable to insect pests at about $2,266,000,000.

The two authors [9] just cited state, "After all, the actual figures as given above mean little to most of us; if we should say, rather, that the net income of the average farmer might be one-fourth greater and foodstuffs and clothing still cheaper than at present if it were not for the activities of several insects we might convey more clearly the importance of insects to the people of the country as a whole in a better fashion." *

We must also take into consideration in our effort to estimate the yearly financial losses due to insects, the amount spent by our people in fighting them—the cost of spraying machines and chemicals, the cost of labor to operate these, and the value of the insect screens used for protection against pests like the housefly. The value of household insecticides bought yearly runs into the millions.

And so it may be seen that the sum of two billion dollars, probably, is a fairly conservative figure and yet most of us go on blindly paying our share of the tribute, suffering our part of the nuisances caused by insect visitation, and pocketing our annual losses without an outcry. The next year the same thing occurs. How long before the figures just cited mean enough to us to make us throw off our lethargy and en masse wage a concentrated war against a common foe? The above figures are given for the United States. The losses would be much greater, as will easily be seen, if we would include the rest of the world.

Typical Pests

The following life histories of well-known insects may be selected at this point for further study in order to familiarize the reader with the facts he should know as a matter of common interest and information and to emphasize the difficulties of those who would control these pests: Japanese beetle, Mediterranean fruit fly, cotton boll weevil, gypsy moth, aphids, and scales.

I. Japanese Beetle: Making its appearance in New Jersey near Riverton, about 1916, this beautiful green beetle with coppery-red

*Reprinted by permission from "Insect Pests of Farm, Garden and Orchard," by Sanderson and Peairs. Published by John Wiley & Sons, Inc.

wings has rapidly made itself felt to be one of the most troublesome of our pests.

It is thought that the larvæ of the beetle entered the United States in the soil surrounding the roots of nursery plants, such as Azalea or Japanese iris. It has spread in New Jersey relatively fast and has entered Pennsylvania. At the end of the summer of 1923, 2442 square miles were known to be infected. The adult beetle eats a wide range of plants, fruit and foliage,—apple, cherry, peach, grape, beans, shade and ornamental trees, roses, althæa, etc. The larvæ in the soil destroys the roots of grass, strawberries and many other plants. I have noticed in my own garden that preference is shown by the adults for the flowers and leaves of hollyhocks and roses. Grape and poplar foliage swarm with them. The adult beetle readily flies from place to place, possesses but few enemies, and may easily secrete itself in moving vehicles. Quarantine areas have been established and a watch kept for vegetable products that might harbor beetles, but the gallant attempts made to check the enemy are thwarted often by the ignorance of people themselves who hide the contraband, and by the fact that beetles may secrete themselves on the tops or in the upholstery of automobiles. Possibly, high winds may aid distribution. Certainly the beetles cannot be prevented from flying across quarantine lines. The fact remains that the zone of occurrence is spreading. In certain months in Philadelphia, it is possible to collect a quart jar full of beetles in a short time and even on the downtown streets they have proved themselves a nuisance by flying into the faces of pedestrians and alighting on their clothing.

In a report on the Japanese Beetle, Smith and Hadley [10] list three pages of plants in New Jersey which furnish food for these beetles. Adult beetles are most numerous in the summer months when they do the above-mentioned damage to foliage and crop plants by their endless feeding. Eggs are placed in the soil which hatch in a few days (ten to fourteen) into larvæ which feed on the soil roots. These larvæ look very much like ordinary white grubs commonly found in soil only smaller. Late the following spring, pupation occurs, and in two to three weeks they emerge as adult beetles.

And how is the fight carried on against the foliage-chewing little devil? Well some of the ways are: (1) Since the Japanese beetle comes from Japan where it is of only minor importance, attempts are being made to introduce into this country insect parasites which apparently hold it in check in its native country. In a United States

Department of Agriculture, Bulletin No. 1429,[2] this phase of the fight is discussed. (2) Arsenate of lead, 6 pounds of the powder to 100 gallons of water has been found effective when used as a spray. Lead arnesate coated with lead oleate has proved itself to be even more effective. (3) Beetle traps are in use. These consist of a container suitably constructed so that the beetles may not escape and an attracting bait whose standard formula for one baiting of a standard trap is:

Geraniol	15 grams
Eugenol	1.5 grams
Bran	75 grams
Molasses	39 cc.
Glycerine (C. P.)	6 cc.

(4) Control of grubs in lawns and golf courses may be accomplished by using carbon bisulphide emulsions or arsenic compounds.

II. Mediterranean Fruit Fly: Long before it was found in this country, the Mediterranean fruit fly was feared and hated in other parts of the world. Great precautions were taken to prevent its introduction into the United States. However, in April, 1929, it was found well established in Central Florida. Much of the fruit of that district had already been shipped out of the state. Energetic emergency measures were taken. Congress appropriated over $4,000,000 and intensive co-operative work was started with the States toward exterminating the pest. All material that had had the opportunity to become infested in any way by the fruit fly was destroyed, and shipments of forbidden material from the quarantined areas were prohibited. The result of these efforts has been success—but those concerned are alive to the danger and alert for new outbreaks.

And why all this trouble about a little insect—a yellowish fly smaller than the housefly with yellow and brown wings and black-tipped thorax? This little demon attacks citrous fruits and the fruits of many other trees, melons, and vegetables. The female fly lays its eggs inside the fruit through the holes she has made with her egglayer. The eggs hatch in the fruit into larvæ which feed on the fruit flesh and spoil it for use. Naturally some fruits are more affected than others. Lemons are not damaged as much as oranges and grapefruit. No means of satisfactory control is known, and it is said that the most significant approach seems to be from the standpoint of encouraging the introduction and spread of the natural parasites of the fly.

III. Cotton Boll Weevil: Spreading up through our cotton lands from Mexico came the cotton boll weevil. At first it attracted but scant attention but gradually as it became established, it brought financial ruin to thousands. Estimates of its annual damage have run up into the hundreds of millions. Although experts realized the gravity of the situation, it was extremely difficult to awaken action among planters who continued to manage their plantations in the same old way. Even though control measures have been found through investigation which make cotton growing profitable, the boll weevil after a little over forty years of residence in the United States is still the greatest pest with which the cotton farmer must wage war.

The insect is a small brown weevil (a kind of beetle) about one-quarter inch in length whose snout is about half as long as the body. The adults pass the winter in rubbish or in the remains of old cotton and corn plants or they may seek the protection of the woods. When they emerge in Spring, they feed on the young cotton foliage until the buds or squares begin to develop. In them, they lay their eggs, and the first larvæ develop, feeding as they do so. Later, the eggs are laid in the bolls with the consequent destruction of the cotton fiber. In a week or so (seven to twelve days) the larvæ, becoming full-grown, change to the pupal form which lasts from three to five days. There may be four or five generations of weevils each year.

The boll weevil would be a far more numerous and destructive pest were it not for the (1) parasitic enemies it possesses, (2) only a relatively small per cent. of the beetles survive through the winters. Experience has also shown that if successful cotton crops are to be raised a new kind of farming must be employed. Shelters where the beetles winter-over must be destroyed; destruction of the fallen squares to kill larvæ or pupæ is helpful; cotton must be grown maturing early enough to prevent it from being attacked by the enemy in the height of their strength. Calcium arsenate is employed, in addition, for best results. Large areas of cotton are now being dusted by airplane with favorable results. Some good has come out of the weevil menace since it taught people to abandon the poorer lands and to become interested in other crops.

IV. Gypsy Moth: The gypsy moth was accidently liberated in this country in 1868 to which it had been brought for experimental work in silkraising. Since that time, it has spread through the New England States into New Jersey. The adult female moth is unable to fly and distribution is accomplished by the larvæ. The eggs are laid on the

back of trees in masses fastened by a cement mixed with hairs from the moth's body. Hatching does not occur until the following spring. The resulting caterpillars feed upon fruit, forest, shade trees and other kinds of vegetation and reach a length of about two inches. The body is dark gray with eleven pairs of prominent tubercles on the back, the first five pairs blue, the rest dark red. Bailey [1] lists the following treatment: the eggs are killed by soaking the masses with crude coal-tar creosote, to which a little lamp-black has been added as a marker. When the young caterpillars hatch, spray the trees with lead arsenate, ten pounds in one hundred gallons of water. For half-grown caterpillars, use thirteen to fifteen pounds of lead arsenate. Full-grown caterpillars are very resistant to poisons. Put tanglefoot around the tree trunks to prevent the invasion.

V. Plant Lice: These small animals with sucking mouths are of vast economic importance because of their destructiveness to many cultivated plants, and also because they are able to reproduce themselves in staggering numbers. It is only due to their natural foes that they are kept in bounds. Howard [4] recounts the classic computation of Huxley that "the uninterrupted breeding of ten generations of plant lice from a single ancestor would produce a mass of organic matter equivalent to the bulk of five hundred millions of human beings (about the population of the Chinese Empire)." Although the number of offspring of a single female is not large, the offspring themselves begin to breed at an extremely early age. For many generations, offspring may be produced by unfertilized females and in many species the young are born alive. However, in autumn, a true sexual generation is generally produced in which males and females both are found and whose females lay eggs instead of producing living young. There are many other curious facts about these little creatures, particularly the development of generations of wingless and winged females—the wingless generations being numerous during the summer and the winged generation or generations providing for the dispersal of the species.

There are many destructive species including those found on melons, cotton, vegetables, citrus fruits, corn, pear, apple, and the peach, etc. Take the case of the potato aphid, for example. It injures the plant by sucking the juices with the resulting rolling of the leaves. It is also said to transmit the potato leafroll disease. The melon aphid (Aphis gossypii) is to be found on the lower epidermis of the leaves of cucurbits and is difficult to reach with sprays. The

grape Phylloxera damages the roots of the grape-vine producing swellings, etc.

VI. Scale Insects: The control of scale insects forms one of the great problems of fruit growers. For example, take the San José scale which is one of the most serious pests of certain fruits. Plants badly infested with this disease appear greyish and multitudes of small scales may be found upon their surface.

The female scale is about the size of a pin's head and round with a raised area in the center surrounded by a depressed ring. The male scale is smaller and egg-shaped.

The mite-like living young produced wander away from the mother over the plant upon which they find themselves and eventually pierce the skin of the host and suck its sap. The waxy protective scale is secreted upon the upper surface of the insect's body with the result that it soon becomes completely covered. About thirty days later, it is mature enough to start producing young. Adult males are tiny winged creatures.

Hundreds of acres of orchards have been thus destroyed by the activity of this one species of scale. Peach, plum, currants, certain cherries, apples, etc., are favorite foods. Treatment which has been employed against it has been lime-sulphur solution and certain commercial miscible oils.

The above examples have been selected out of hundreds. In fact, it is a rather difficult matter to pick out judiciously the best possible examples of the damage wrought by insects. As I write this line, my eye falls upon a pamphlet before me entitled "The More Important Shade Tree Insects of Eastern Canada and Their Control," by J. W. Swaine and C. B. Hutchings,[11] in which is given an extensive list of the economic insect pests, twenty-two mentioned in the case of maple; seventeen for poplar; sixteen for willow, etc. It is difficult not to write a few words concerning the activities of the cutworms; those troublesome pests responsible for wormy apples,—the codling moths; the grasshoppers or locusts, which at times have appeared in hordes with the subsequent depletion of vegetation; the armyworm; the European corn borer whose possibilities for destructive activity to corn is immense; the chinch bug; the Hessian fly—that destructive enemy of wheat; the Colorado potato beetle with its ten-striped back; the plum curculio; the peach tree borer found the country over in

peach orchards, etc., etc. Anyone interested in securing more information concerning the list just mentioned and many others would do well to consult "Insect Pests of Farm, Garden and Orchard," by Sanderson and Peairs [9] or for a shorter account "Common Pests," by R. W. Doane.[3] If the writer has brought home to you something of the vastness of the insect world and the extreme economic importance of some of its species, his purpose has been accomplished.

In many regions, life is made unbearable at certain seasons of the year by innumerable myriads of tiny blood-sucking flies and mosquitoes. Many of our streams and lakes—otherwise pleasant spots for true enjoyment are metamorphosed into little infernos due to the activities of these tiny foes. The small black flies or buffalo gnats cause much discomfort by their bites, and the bitten areas may later become swollen and painful for several days as a result of a poison that is injected into the wound from the salivary glands.

"It has been reported that persons left exposed with no means for protecting themselves from the bites of swarms of these insects have died as a result of the suffering and from the poison that was introduced into the body." [3] Where the clothing is torn as may occur in passing through heavily wooded areas, these little pests crawl through the holes. Animals are affected even more seriously than man. Since the larvæ are aquatic, and are found clinging to rocks in

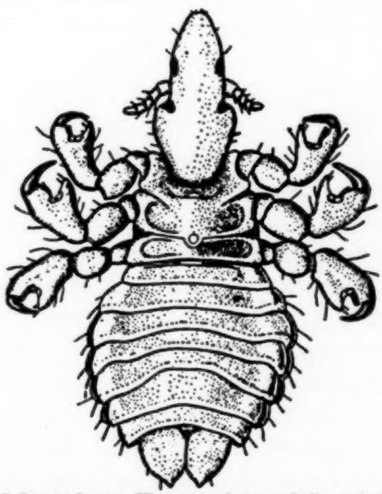


Fig. 1—Large-headed horse louse (Haematopinus asini), (much enlarged). Reprinted by permission from "Common Pests," by R. W. Doane; published by Charles C. Thomas, publisher.

running water, extermination or control is very difficult. Protection may be imperfectly accomplished by smoke smudges and repellants smeared on the face. Very fine mesh veils if they can be kept free from holes probably do as much good as anything.

The punkies are another group of still smaller tormentors. Since these flies are hard to see clearly without the aid of a magnifying glass, it is obvious how they received their Indian name of "no-see-ums." Each punkie is a "mere speck of matter, and it is difficult to understand how this small being can harbor the vast amount of 'cussedness' it is known to possess." [3] The larvæ are apparently aquatic, being found in pools of water in hollow stumps, in the sap of bruised tree trunks, etc.

Another group of commonly-known obnoxious flies are the horse-flies and deerflies of the family Tabanidæ. The deerflies are now known to be instrumental in the transmission of tularemia, a disease of rodents, especially jack-rabbits. The gadflies or horseflies lay their eggs on the stems of aquatic plants. The adults have a powerful bite and may carry the germs of certain diseases such as anthrax. It is interesting to note that in this family, it is the female fly which is the biter—the male being harmless.

Although we do not have space in this paper for a general account of their activities, the following groups of flies must be mentioned because of their economic importance: the stable fly (Stomoxys calcitrans), once suspected of carrying infantile paralysis, may become a serious nuisance to cattle; the horn flies (Hæmatobia irritans) which annoy and disturb cattle by their constant biting; the blue bottle and green bottle flies which are so commonly known. The screw worm flies affecting domestic animals and even man in the Southwest are of special interest. The fly lays its eggs in scratches it may find on the epidermis of its victim, and the hatched-out larvæ live in the flesh producing a sore. Another family of flies having an economic importance is the bot fly family. Several forms of these cause suffering and death of domestic animals. Take the "ox bot" or "ox warble" of the United States as an example. The flies in spring time lay their eggs upon the legs of cattle near the hoof. Some believe that when the victim licks its legs, the parasites are carried to the œsophagus, whose walls they penetrate. Finally the larvæ reach the back of the animal just under the skin where they cause sore spots. It is interesting to note that many investigators now think that the larvæ penetrate into the connective tissue near the

spot where they hatch from the egg and then make their way through the connective tissue to the back of the animal. Here they grow and eventually work their way out of the skin and drop to the ground where in the course of time they change to adult flies. Horse and cattle are afraid of these flies and often stampede in order to escape them.

Certain swampy and marshy parts of the globe are the natural breeding grounds of hordes of mosquitoes irritating and often dangerous to man. (Figs. 2, 3.) Mosquitoes are widespread, but many localities have been able to wage a successful war against them. Besides being a nuisance, certain mosquitoes (Anopheles) carry the deadly malaria—a disease which has long taken its toll in human suffering. Certain parts of the world—western Africa, parts of India—abound with it. Italy has been hindered for centuries in its development. In fact, the history of the world has been changed by the Anopheles mosquito. In the United States the number of deaths due directly to malaria is not large and is decreasing as the people are making determined efforts to eradicate the foe. Although in many localities, malaria has been thwarted by the elimination of breeding places of the mosquito, yet there are other spots, particularly in certain parts of the South where it is still prevalent.

It is not possible to estimate accurately the true menace of this disease when established in a community, because the victims lose much of their capacity for initiating and accomplishing work and also because they are often so weakened by the disease that they readily succumb to other causes.

Farmer's Bulletin No. 450, "Some Facts About Malaria," indicates three recognized means of warfare against the mosquito: (1) mechanical protection by gloves, veils, etc.; (2) destruction of Anopheles mosquitoes which has been attended by success in Cuba, Panama, Egypt and West Africa and certain places in India; (3) systematic treatment of the population of a malarial neighborhood by quinine. This latter method has been used by the Germans in East Africa and by the Italians. In Italy the use of methods 1 and 3 reduced the malaria rate from 65 or 70 per cent. to less than 4 per cent.

It is not the intention of the writer to describe the life history of the malarial parasite and the effects of quinine on the parasite. The reader is asked to refer to another volume of the Popular Lecture Series to an article "Animals That Live in Man," volume 6, where some of the above phases are discussed. Since the eggs are laid in standing water and the young wrigglers hatching from these eggs are

air breathers, draining of marshes and pools destroys breeding places as well as redeems waste lands. When it is not practical to drain marshes, kerosene or crude oil mixtures may be sprayed over the surface of the water so that a thin film shuts off the air supply of the wrigglers (Fig. 3). Likewise, "It has been found that Paris green mixed with road dust, fuller's earth or other dusts when scattered over the surface of pools will destroy Anopheles larvæ." [3] It is indeed fortunate, that only a few species of the genus Anopheles out of the known hundreds of mosquitoes are harbingers of the protozoan parasite (Plasmodium) which causes malaria when introduced into man.

But the mosquito has more on its conscience than the carrying and spread of malaria. A tropical disease known as elephantiasis, caused by a round worm, is carried by about a dozen species of mosquitoes. The victim shows his disease by enormously swollen limbs or other parts of the body due to obstruction of the lymph passages.

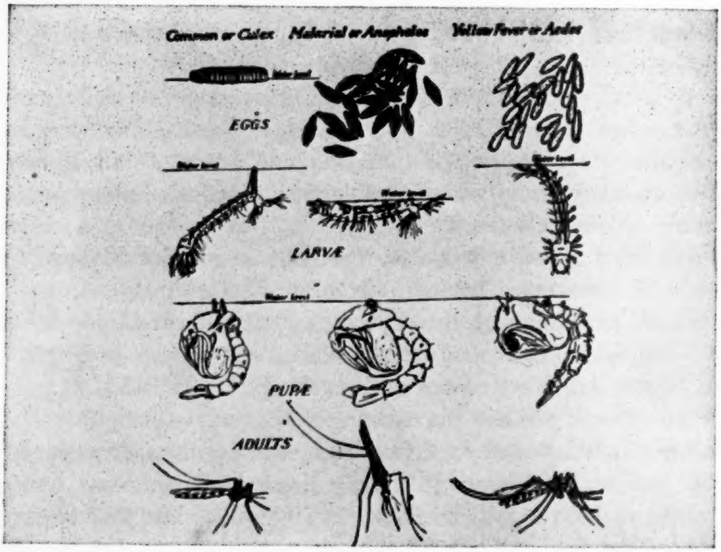


Fig. 2—Three important kinds of mosquitoes, showing egg, larva, pupal, and adult stages of each; in the left-hand column the life stages of a common house mosquito, in the center column of a malaria mosquito, and in the right-hand column of the yellow-fever mosquito. Two or three times natural size. (From "Everday Problems in Science," by Pieper and Beauchamps; copyrighted 1925, by Scott, Foresman & Company.) Reprinted by permission from "Fundamentals of Insect Life," by Metcalf & Flint; published by McGraw-Hill Book Company, Inc.

A mosquito-spread disease closely affecting us in the United States is yellow fever. The work in Cuba of Drs. Walter Reed, James Carroll and Jesse Lazear of the United States Army, and Dr. Agramonte of Cuba, on this disease will ever be remembered. It was during these experiments that Lazear gave his life for science by being bitten by an infected mosquito. Aedes ægypti, a small black species with white markings on legs and thorax was discovered to be the carrier (Fig. 2).

Today the yellow fever is little known with us, but the picture in the nineteenth century was entirely different. There were widespread epidemics in the southern states. "The last widespread epidemic occurred in 1878, chiefly in Louisiana, Alabama, and Mississippi, but spreading up the Mississippi Valley as far as Cairo, Illinois and attacking the city of Memphis, Tennessee. In this year there

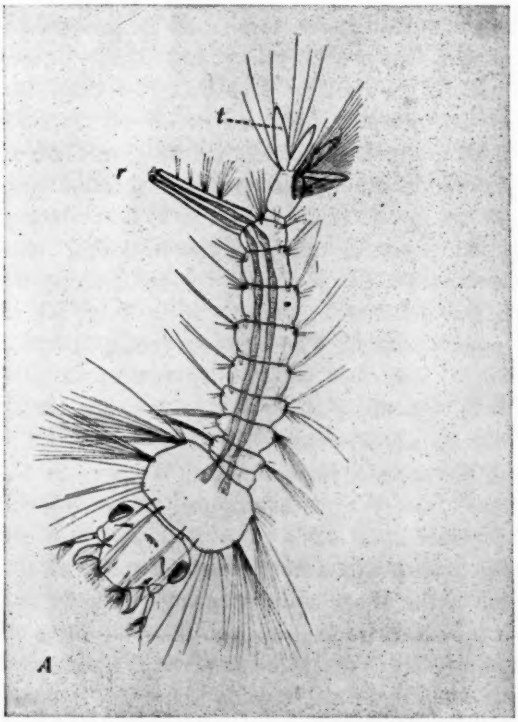


Fig. 3—Larva of mosquito, Culex pipiens; r, respiratory tube; t, tracheal gills. Reprinted by permission from "Entomology," by J. W. Folsom; published by P. Blakiston's Sons & Company.

were 125,000 cases and 12,000 deaths." *[5] The epidemic was attended by hardships induced by a huge cut in commerce.

In the years from 1793 to 1900, it is said that there occurred in the United States not less than half a million cases of yellow jack with a mortality of one hundred thousand. Nor was the disease entirely limited to the southern states, for it found its way into ports along the Atlantic coast as far north as Philadelphia and New York.

As a result of the efforts made to bring the mosquito situation under control in Havana, as well as concentrated action on the part of other communities, the disease has been almost stamped out since the work of Reed and his colleagues.

A painful disease known as breakbone fever, also occurring in epidemic form in some southern states, has been found to be carried by certain mosquitoes. (Culex quinque-fasciatus and Aedes aegypti.)

In conclusion, we may say that the charge against mosquitoes as carriers of breakbone fever, elephantiasis, malaria and yellow jack is the most serious that probably faces any family or group of insects.

The house fly is another pest that has been found guilty of spreading disease to man. Most of us are so accustomed to seeing house flies in all manner of places that we give them scant attention. It certainly therefore behooves us to stop and actually learn something concerning the fly menace. To begin with, flies breed in all kinds of filth, laying their eggs in decaying material and manure wherever conditions are correct. Each female fly lays a large number of eggs during her life which hatch out into white maggots with two black spots on the posterior end. The maggots feed on the filth and develop to the state in a few days where they are about to become pupæ. After some days, depending upon the temperature, the adult flies issue forth from the pupal covering. Howard[4] gives the total life cycle for a single generation at summer temperatures at about ten days, and thus in the vicinity of Washington, twelve, or thirteen generations can be produced.

As flies are creatures reared in filth, some of it necessarily is found clinging to the short hairs covering the body and legs as well as that which they have sucked up into their digestive tubes (Fig. 6). Flies lighting on foods at mealtime or perhaps upon the tops of babies' bottles, may contaminate these with some of the microbe-infested stuff. And as we eat food with which flies have been in contact, let us

*Reprinted by permission from "The Insect Menace," by L. O. Howard. Published by the Century Company.

realize that there is that added portion of filth present brought by the fly from its feeding grounds. In this way, the typhoid fever germ may be carried by flies and spread to unsuspecting victims. I have dined in hotels where the bathroom was but an offset from the dining room and where flies were abundant, and yet I seemed to be the only one who lost "the edge of his appetite." The owners of the house were apparently trying to be as clean as they knew how, but totally ignorant of the facts. Doane [3] makes the following significant statements: "There is abundant evidence to show that flies are directly concerned in the spread of intestinal troubles of children, which every year cause the death of more than fifty thousand infants in the United States. Most of this appalling loss is caused by milk that has been contaminated by flies while it was still in the dairy barns or in the market place. The germs that cause colds, influenza, tuberculosis, cholera, and other diseases may sometimes be disseminated by the same busy little agent. It must not be understood that the house fly is the sole factor concerned in the transmission of these diseases, for they are all spread more commonly in other ways; but the fact that it so often is responsible for the dissemination of at least the germs that cause typhoid and summer diarrhea is enough to make this common and filthy pest a thing to be despised and abhorred."

Fortunately, the housefly prefers to frequent horse manure, and since the advent of the automobile and its subsequent rise to popularity, horses are becoming scarce in our larger cities, thus robbing flies of their favorite breeding places. However, the control of the housefly has never really been solved on a large scale. The messenger of sickness and disease still enters our own homes and during much of the year, even when eliminated inside, may always be found waiting opportunity of entrance on the screens. Traps, sprays and sticky baits are in use, and those who realize the danger are trying to remove and destroy possible breeding places. The people as a unit, must be taught the menace that lies in these uninvited guests.

At this point, the activities of the tsetse flies of Africa should be mentioned since they are responsible for carrying to man the fatal African sleeping sickness.

Finally, it remains but to say a few words in this imperfect account of the activities of fleas, lice and bedbugs. Lice (Fig. 1) are wingless insects parasitic on man and other animals. Pediculus humanus lives on Man where it fastens its eggs, "nits," to the hair. The hatched young pierce the skin with their beaks and suck blood.

To the account of the body louse is charged the responsibility for the transmission of the organisms of typhus fever. This disease was brought into prominence during the World War and certain investigators found that its spread was due to the activities of lice or "cooties" and then followed emphasis upon delousing operations. Likewise trench fever is another louse-carried disease, appearing in places where opportunity would not permit the removal of the tiny insects.

Fleas are degenerate, wingless, parasitic insects with sucking mouth parts and long hind legs. Man is attacked by Pulex irritans the world over. The Bubonic plague is carried by certain fleas and in this way may be directly inoculated into the blood by the mouth parts of the carrier. Rats having this disease are usually badly infested with fleas which in turn have the bacilli in their own bodies introduced with the rat's blood they have sucked. If opportunity arises, some of the rat fleas will attack man, spreading the disease in this way. Eliminate rats (and certain rodents) and eliminate the disease at its source.

Bedbugs are well-known pests in certain localities, and their irritating bite often makes their presence noticed at the most unseasonable hours of the night. During the day they conceal their flat, pliable bodies in whatever hiding place they chance to find—a crevice in the bed or floor—but at night they venture forth in search of food. Eliminate them early by determined use of preventative measures.

Another charge which may be made against insects is their transmission of various plant diseases. As insects go from plant to plant, they may come into contact with various fungal diseases—the spores or hyphæ of which may contaminate their mouth parts and bodies. Later passing to other plants, these diseases may be carried and established in the new host through the punctures in the plant tissue. Even though no spores may actually be carried by the insect, nevertheless it is easily conceivable that the holes in the plant epidermis may afford entrance to plant parasites blown there by the wind. Thus the holes of the plum curculio are often the infection centers for the brown rot of peach organism. In another Popular Science lecture, volume 9, I discussed "Fungus Friends and Foes," and the readers of that paper will be readily aware of the tremendous danger that these open avenues for infection afford. Metcalf and Flint state:[8] "The organism causing early blight of potatoes is similarly favored by the numerous holes made in the leaves by flea beetles; chestnut blight, by the various bark

beetles and borers attacking this tree; and the bacterial boll rot of cotton by boll weevils and bollworms."*

An interesting phase of the problem is the discovery that in certain cases the insect is apparently necessary to the disease-producing organism—a part of its life cycle or development taking place within the insect's body. This has been found true in the relationship of the cucurbit wilt disease, which winters over in the digestive tubes of certain cucumber beetles. When the beetles begin feeding on the cucumber plants the following spring, the disease organism passes out in the beetles' fæces and is washed by rains into holes in the epidermis of the leaves, with the establishment of the disease in the new plant. The reader should refer for more information to Metcalf and Flints' [8] excellent "Fundamentals of Insect Life."

Friends

However, as gloomy as is the picture just drawn concerning insect activities, we must not forget that certain insects have proven a blessing to the human race. Silk has proved its value for centuries, and a great industry has arisen about this product of the silkworm or caterpillar produced when it is spinning its cocoon. Twenty-seven hundred years B. C., in China, the silk industry appears to have had its beginning, and for the next three thousand years the Chinese held a monopoly on the art. Gradually, however, the cultivation of the silkworm spread through Asia, crept into Europe, and reached France about the thirteenth century, where it later flourished. Spurred on by the heavy demands for silk, chemists have now produced various types of artificial silks which seriously compete with the natural product.

Silk is really the saliva of the caterpillar, which hardens when it comes into contact with air, forming a thread which the animal uses in building its cocoon in the protection of which it may pupate. Commercial natural silk is obtained by the unwinding of these cocoons at the proper time and subsequently passing the product through a series of operations which are designed to produce the lovely fiber all of us know.

Honey is a saccharine substance gathered mostly from the nectaries of flowers and placed in the honeycomb of the honey bee, Apis mellifica. Although other insects may store honey as food, Man has found it gainful to devote his attention to the honey bee. Honey is

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official in the U. S. P. X, where it is called Mel. Likewise Cere Alba U. S. P. X (white wax) is furnished by the Apis mellifera. It is the bleached yellow wax and is used in pharmacy in the making of cold cream and simple cerate. Cera Flava U. S. P. X (yellow wax) is a product obtained by the melting and purification of the honeycomb of the bee. In order to learn more concerning the formation of the honeycomb, the reader is asked to refer to "Social Insects," volume 2, another lecture of the Popular Science lecture series. Cochineal is yielded by the dried female insect containing her larvæ of the Coccus cacti, a kind of scale insect which lives as a rule on species of the Cactus family found growing in Mexico and Central America. When chewed, cochineal reddens the saliva, due to the coloring principle—carminic acid. Cochineal finds its use in medicine and forms the source of carmine. Carminum N. F. or carmine used as a coloring agent for pharmaceutical preparations, etc., is defined as the aluminum lake of the coloring principle obtained from cochineal. About 70,000 insects are needed to make a pound of cochineal.

Cantharis U. S. P. X is yielded by the Cantharis vesicatoria De Geer. This beautiful brilliant green or bluish green beetle yields a substance known as cantharidin, making it valuable as a vesicant. Taken internally, cantharides has an aphrodisiac and diuretic action. That cantharidin may be obtained from certain other bettles has been demonstrated by Dr. Arno Viehoever.

Other examples of insects' products useful to man may be mentioned. For example, certain insect galls contain astringent properties such as those produced on the oak, Quercus infectoria, by the female Cynips tinctoria; some galls yield dyes. (See "Abnormal Plant Growth," Popular Science lecture, volume 4.) Shellac is made from the substance yielded by a tiny species of scale insect living on forest trees in India.

Nor indeed must the importance of insects as pollinizers be overlooked. Many of our common plants, beans, melons, clover, buckwheat, etc., depend upon their insect visitors to transfer pollen from the stamens or male organs of one flower to the stigmas of another and thus make the production of fruit and seed possible. Bumble bees are essential to the clover and as pollen carriers are worth their weight in gold. A small wasp has been found responsible for the pollination of the Smyrna fig.

Neither must the part played by certain parasitic insects in helping to control species which threatened to become plagues be forgotten.

In the terrible battle for life continuously being waged, these forms help to keep down the numbers of certain insects which, if left unchecked, would soon eat up their favorite foods—often intended for Man's own consumption. These insect friends may fall into two groups: those that act as parasites, living on or in the bodies of Man's insect enemies, and those which actually capture and eat harmful insects—predators. The problem is too vast to be treated here, but herein lies a fertile field for activity and investigation by those interested.

Other uses performed by our insect friends may be listed: (1) destroyers of certain weeds, (2) fertile material for investigating various natural principles and relationships, (3) improvers of the texture and nature of the soil by aerating it by burrowing and depositing their castings, (4) acting as scavengers—eating the substance of dead plants and animals, (5) as food for fish and game birds, and (6) the medical profession is beginning to appreciate the activities of certain fly maggots, aseptically raised, in cleaning away the diseased matter in the disease known as osteomyelitis, (7) certain insects have been used as food by primitive peoples.

Thus we see that in spite of their faults, Man owes much to those forms he has found friendly and useful. It behooves every individual to learn as much concerning the group as he has time to in order that he may be of help in exterminating pests and encouraging friends.

Control

Evidence has been presented in this paper of the vast damage caused by insect visitation. Let us now see how man is defending himself. No one method is useful throughout since the insect group presents a diversity of structure and habits. Some insects, like the grasshoppers and the Japanese beetle, are equipped with biting mouth parts—chewing up small bits of plant tissue. Plants, of course, may quickly give evidence of their loss by their pierced and chewed-up parts. Other insects, like the aphids mentioned some pages ago, have mouth parts with which they can pierce the protective plant skin and suck up the plant juices—in this manner depleting the plant's vitality. Of course, a few aphids would probably not produce a great effect on a healthy plant, but when you consider how quickly they multiply and the great number of tiny forms which may be sucking vital juices at the same time, the results are not surprising. It is stated that more than one thousand acres of apple orchards were killed in Illinois by

the San José scale in the years of 1921 and 1922 even though carefully sprayed.[8] *

Fig. 4—Department of Agriculture warning against the European corn borer. (After Caffrey, U. S. D. A.) Reprinted by permission from "Insect Pests of Farm, Garden and Orchard," by Sanderson and Peairs; published by John Wiley & Sons, Inc.

Another difficulty in the way of treatment occurs in the case of those insects such as the borers, which live inside of different plant tissues where sprays will not reach. The trunks of trees may be channeled inside by the activities of various borers—not only the outer parts of the bark and the cambium but the wood as well. The caterpillars hatching from the eggs of the European corn borer, a small moth, find their way into the tassels, the ears and the stalks of the corn plant and they live in the stalks during the winter (Fig. 4). The

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clover root borer is a pest which bores its way into clover roots and is doubly difficult to reach—internal and subterranean.

From the above it may be plainly seen that in order to kill insects we must know insects. If we are to break the life cycle at any one point, it is necessary to be familiar with that life cycle. We must spend our time in learning how to anticipate their activities and then strike wisely and concertedly.

The two general ways in which Man is endeavoring to control insects are (1) chemically, and (2) biologically.

1. *Chemically*—by the use of

(a) stomach poisons such as arsenate of lead and other arsenicals, sodium fluoride, rotenone—placed on the food of insects and taken into their stomachs when they are eating (Fig. 5);

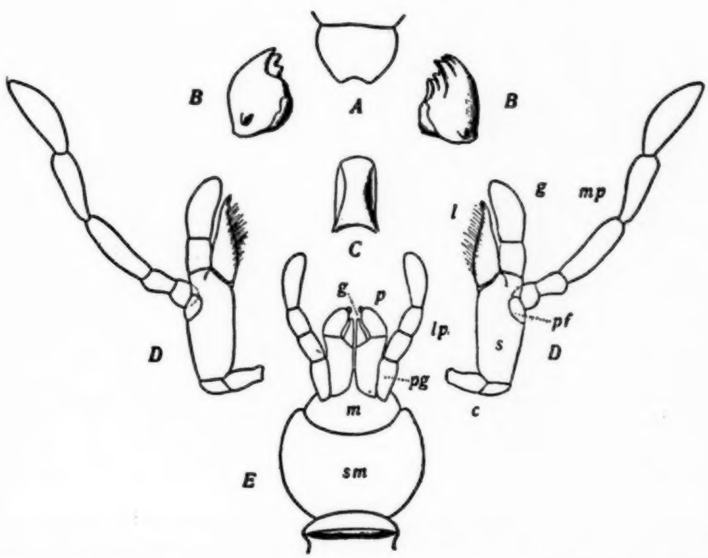

Fig. 5—Mouth parts of a cockroach, Ischnoptera pennsylvanica. A, upper lip; B, jaws proper; C, tongue; D, under jaws; E, under lip. Reprinted by permission from "Entomology," by J. W. Folsom; published by P. Blakiston's Sons & Company.

(b) contact poisons such as sulphur, lime-sulphur compounds, different oil sprays, nicotine, pyrethrum, which kill the victims when they are applied to their surfaces;

(c) fumigants—such as sulphur, carbon tetrachloride, formaldehyde, etc.;

(d) repellants like Bordeaux mixture, tobacco dust, etc., which do not kill insects, but simply drive the intruders away because they do not like the substance used.

2. *Biologically*—

(a) Encouraging the establishment and spread of parasitic and predacious insects which, although they do but little damage themselves, feed upon other obnoxious insects. For example, a certain ladybird beetle has been successfully introduced into California for

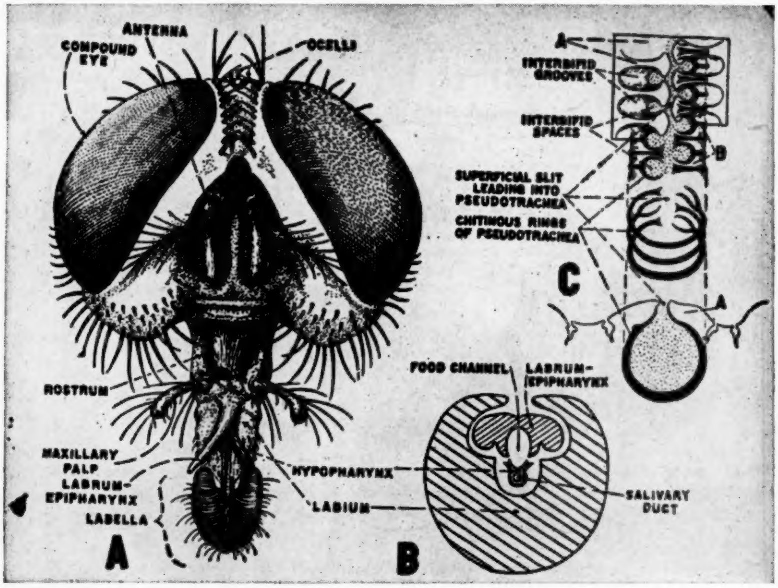

Fig. 6—Sponging mouth parts as found in the house fly. Reprinted by permission from "Fundamentals of Insect Life," by Metcalf and Flint; published by McGraw-Hill Book Company, Inc.

the control of a scale on citrus, and other insect forms are being tried out on the Japanese beetles. King and Holloway [7] describe, for example, a wasp-like parasite that they believe because of certain existing indications will prove to be an important factor in the control biologically of the Japanese beetle.

(b) Planting wherever possible resistant varieties of plants—that is, selecting those varieties which are least injured by the particular insect enemy found where they are growing.

(c) Establishment of fungal diseases of insect pests. Insects have their diseases which help to keep down their numbers.

(d) Proper rotation of crops, and in some cases the planting of early maturing varieties which reach perfection earlier in the season before the parasite has reached its height of development. Thus Imms [6] shows that with certain cereals, their time of sowing has a direct relationship to their liability of attack by the frit-fly (Oscinella frit).

(e) Destruction of stubble in the fields, rubbish, weeds, etc.,—places where insects may spend a part of their lives finding protections.

(f) Drainage of swamps, standing pools, etc., to eliminate forms like the mosquito.

(g) Establishment of plant quarantines to prevent spread of a particular pest.

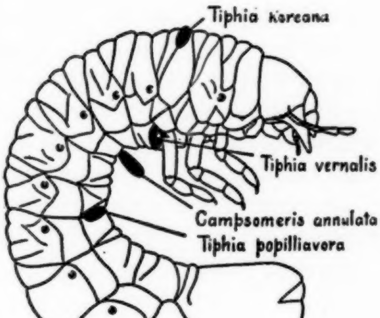

Fig. 7—A Japanese beetle grub, showing the position of the eggs of the four species of parasites upon it. Reprinted by permission from "The Parasites of Popillia Japonica in Japan and Chosen (Korea) and Their Introduction Into the United States," by Clausen, King and Teranishi, United States Department Agricultural Bulletin No. 1429.

The following significant reference appears in one of our daily papers as I am writing this article: "Havre, France, March 11th. Twenty thousand barrels of American apples, which arrived today on the Ile de France, were not allowed to be unloaded because of the

embargo recently declared on fresh fruits suspected of carrying San José scale."

No attempt has been made here other than to present in outline form some of the ways in which the war is being fought. The reader should turn to texts devoted to that purpose in order to ascertain the exact proportions of chemicals to be used, cautions for their use, what pests they should be used against, etc.

Conclusion

We must not suppose the insect to be a mean enemy. In many ways, by virtue of his organization, he is our superior. He was on the earth many million years before the first human creature walked its surface, and today he is more powerful than ever. When Man started to raise food for himself, he likewise set a bountiful table for his insect enemies, who found a place where they could live, rear their children in comfort—always with a supply of food on hand. And so the ways of man have proved beneficial to the insect world.

Insects have shown themselves to be biological successes. The substance known as chitin which covers the insect body is a nitrogen-containing substance (hydrogen, carbon, oxygen and nitrogen are present) (soluble in Javelle water) which withstands the action of ordinary alkalies and acids and does not get frangible with age. Whether the insect in question is a tough-skinned beetle or a defenseless aphis, this substance forms the external covering. In addition, the muscles of their bodies are not on the outside like our muscles, but are found on the inside of the chitinous covering. This gives great protection. A man would be able to leap many times his own length if his muscles functioned as efficiently as those of certain insects such as the grasshopper or flea.

Various insects have the external parts of their bodies modified for the function they are going to have. Thus we see the oar-shaped hind legs of the water boatmen; the curious modifications of the honey bee's legs for carrying pollen; the wingless flea with its jumping legs. Mouth parts also may vary greatly—each type adapted to the life of its possessor—the sucking mouth of the squash bug differing from that of the house fly, and the chewing mouth of the grasshopper. Some insects are externally modified so they look like the objects found in their environment and may be protectively colored. Shape and color play their parts in protection.

Another factor in the insect's success is its speed of propagation. For example, Dr. Howard has shown that a single over-wintering female house fly may have in the latitude of Washington by the last of September this staggering number of descendants, 5,598,720,000,000.* Not only do insects produce a large number of eggs but generation follows generation rapidly. As has been pointed out for plant lice, reproduction without fertilization of the egg among insects is not uncommon. In fact, there are records of groups where immature insects give birth to young. In certain groups, the young may be brought forth alive. When an insect's work is done, it dies—no lingering old-age to be taken care of at the expense of friends and relations, but new, active individuals have taken his place.

Insects have adapted themselves to life under many vastly varying conditions—hot springs, alkali deserts, oil pools, mountain snow, forests, meadows, animals, salt marshes and even the sea. They support themselves as a class on a wide variety of food being able to use in general the substances found in nature.

Singularly free from disease, inhabiting earth, water, and air, possesing a remarkable variety of food habits, displaying infinite structural modifications of antennæ, wings, legs, body, etc., propagating with amazing rapidity and startling versatility—in short, adapting themselves to all sorts of places and all types of lives—the insect group presents a real problem. Man's hope lies in his superior brain—his ability to observe, collect facts, logically arrange them, formulate hypotheses, test them out, and draw conclusions. He is waking up to the fact that the "bug hunter" is no longer "queer" but that he himself must be a "bug hunter" if he is to prosper in the future. The problem is a real one and victory will not be gained without a severe struggle. Realization of the threat and intelligent continuous effort not by the few but by the united activity of all of us is needed—must be had—if we are to conquer eventually. I do not mean that everyone should be a trained entomologist, but I do mean that all opportunities should be afforded and encouragement given to those who wish to and who have the capabilities to investigate the insect world, and I also mean that each of us should be willing to follow the directions of our trained leaders in fighting the common enemy. The apartment dweller in New York may not be directly concerned with the insect problems of the Iowa farmer, but he is directly responsible for the elimination, let us

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say, of the disease-carrying house fly that frequents the cesspool and then sits on his dining table.

It's up to us!

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LINNAEUS' MISTAKE

Cinchona bark had been used for more than 100 years in Europe before any data had been assembled by scientific men as to the botanical characters of this tree. The interesting fact is that the first botanical description of this tree was not recorded by a botanist, but rather by an engineer and mathematician, Charles Marie de La Condamine. The scientific name of Quinine bark should be Chinchona instead of Cinchona, for it was named in honor of Countess Chinchon. The name Cinchona applied to this genus of plants was assigned by Linnaeus, the noted Swedish botanist, father of the scientific method of assigning a generic and specific name to plants. At the time that Linnaeus wrote the name for this genus of plants he left out the letter "h". This mistake on his part was not discovered until some forty years later. Many attempts have been made at international botanical congresses to change the name to Chinchona, but without avail.

A. H.

NEWS ITEMS AND PERSONAL NOTES

Remington Medal Awarded to Editor Eberle—One of the outstanding features of the observance of Pharmacy Week was the award of the Remington honor medal to Dr. E. G. Eberle of Baltimore for outstanding service to American pharmacy. The award was made at dinner in honor of the recipient at the Hotel Emerson, Baltimore, Maryland, on Wednesday evening, October 12, 1932 at 7:00 P. M. The dinner was arranged under the joint auspices of the New York and Baltimore branches of the American Pharmaceutical Association.

The Remington medal was established by the New York branch of the American Pharmaceutical Association in 1918, to be awarded annually to the man or woman who has done most for American pharmacy during the preceding year or whose efforts during a number of years have culminated to a point during the preceding year, where the result of these efforts would be considered as being the most important and advantageous for American pharmacy. The recipient is selected by a committee consisting of all the past presidents of the American Pharmaceutical Association.

The first impression of the Remington honor medal was awarded to Dr. J. H. Beal; the second, to Dr. J. U. Lloyd; the third, to Dr. H. V. Arny; the fourth, to Dr. H. H. Rusby; the fifth, to Dr. G. M. Beringer; the sixth, to Dr. H. M. Whelpley; the seventh, to Mr. H. A. B. Dunning; the eighth, to Dr. C. H. LaWall; the ninth, to Dr. W. L. Scoville; the tenth award, to Dr. E. F. Cook.

National Conference on Pharmaceutical Research Awards Fellowship—The National Conference on Pharmaceutical Research awards first fellowship. Mr. Edgar A. Kelly, candidate for the degree of Doctor of Philosophy of Washington State University of Seattle, Washington, made recipient of this award. Mr. Kelly's qualifications to carry on research were deemed superior to those presented by the candidates from any other schools, and the award was made to him to continue his work in pharmaceutical research on "Senecio Aureus" in the College of Pharmacy of that institution.

BOOK REVIEWS

Handbuch der Chemotherapie, von Dr. Viktor Fischl, Abteilungsleiter der Schering-Kahlbaum A.-G., Berlin, unde Prof. Dr. Hans Schlossberger, Mitglied des Reichsgesundheitsamtes, Berlin-Dahlem.

The word chemotherapy, by analogy with such words as electrotherapy or hydrotherapy, should signify treatment with chemical agents. But by almost universal usage in both America and Europe it has come to be limited to mean the treatment of disease by agents acting upon the causative organisms, what the pharmacologists of a decade ago referred to as etiotropic drugs; that is directed towards the cause. The general concept residing today in the word chemotherapy, is not far removed from what our fathers called "specific." The difference is chiefly that the older physicians had to depend on agents—like cinchona, male fern or the inorganic salts of mercury—which were provided for them by the forces of nature, while the present generation is seeking to understand the fundamental chemical principles of these specifics and to prepare synthetics more potent than the natural remedies. The modern epoch of chemotherapy may be said to have commenced with the work of Ehrlich, which resulted in the introduction of arsphenamine, in 1910. Since then chemists and biologists have devoted an enormous amount of thought and labor to the development not only of new and better antisyphilitics, but also in searching for specific cures for malarial fever, tuberculosis, pneumonia and a host of other diseases of parasitic origin.

The vast number of new organic compounds which have been prepared by the chemists, and the tremendous number of experiments which have been carried out by the pharmacologists, has brought into existence a plethora of literature, the mere contemplation of which causes intellectual vertigo. We are in danger of being driven into the position of the man who was unable to see the forest because of the trees. Chemotherapists have been so occupied in accumulating facts that they have scarcely had time to properly digest the results of their experiments.

It seems rather remarkable that, as pointed out in the preface of the present volume, "until now there exists no comprehensive presenta-

tion of chemotherapy." This surprising void promises to be well filled by this book when it shall have been completed.

Our first reaction in looking through this volume was one of almost awe-struck marvel at the stupendous labor which had been expended in its preparation. The literature quoted covers practically all the important contributions germane to the subject which have been reported during the past 200 years either in Europe or America; parenthetically, it is gratifying to find in a German book such liberal recognition of the work of American investigators.

The comprehensiveness of presentation may be inferred from a brief review of the article on cinchona derivatives. This begins with a critical review of the history of the discovery by Europeans of the antimalarial value of Peruvian bark, with liberal quotations from the authors of the seventeenth century. (Incidentally, grave doubt is thrown on the truth of the venerable tradition that the beautiful Ana de Osorio was cured of malaria in Peru and was responsible for the introduction of this bark into Europe: apparently she had died, and her husband remarried before he was appointed viceroy of Peru.) The article goes on then to discuss the botanical relations of the genus cinchona and closely related trees; then follows an elaborate consideration of the chemical structure and physical properties of the alkaloids of cinchona bark and a description, with structural formulæ, of some twenty synthetic derivatives. The pharmacologic part gives the results which have been obtained with both the natural and synthetic alkaloids in the treatment not only of malarial fever, but trypanosomiasis, dysentery, pneumonia, etc.; the toxic and therapeutic dose for rabbits, cats, canaries and other animals; and a critical survey of the final results which may be expected in the treatment of various types of malarial fever with derivatives of cinchona bark. The discussion of the question of whether quinine exerts its beneficent influence in malarial fever through a direct effect upon the plasmodia is given in an unbiased summary of the experimental evidence from 1912 to 1930, which ends with the moderate statement that the evidence points to the probability that quinine is changed into the real active substance after it enters the body. The list of references quoted on cinchona bark and its derivatives cover nine double columed pages.

The rest of the volume is compiled with similar painstaking thoroughness. One is somewhat surprised to find even mention of such

folk remedies as sunflower, calamus, ko-sam, quassia, horsechestnut, etc., among such a gathering of the medicinal elite as ethylchaulmoograte, acriflavine, emetine, and ascaridol.

The present volume, which covers the consideration of "metal"-free organic compounds, is the first of three parts which will complete the *handbuch.* Part II, which is promised for this Fall, will cover the compounds of arsenic, antimony, iodine and the heavy metals. Part III is to present a detailed consideration of: the present theories that form the basis of chemotherapy, the problems of drug-fastness of pathogens, a complete survey of the working methods in chemotherapy and the general index. It is expected to be ready in the Spring of 1933. The price of the present volume is twenty-nine marks (approximately $7.25 at the current exchange). The subscription price for Parts II and III is twenty-two marks each.

We feel that the whole medical world, including chemists, pharmacists and physicians, owes a debt of gratitude to the authors of this survey and that no worker in the field of chemotherapy can afford not to have it in his library.

H. C. Wood, Jr.